Claims

We claim:

1. A method of determining a location of a mobile-station comprising the steps of:

determining a set of candidate locations for the mobile-station based on a timing advance value associated with the mobile-station;

determining a location of the mobile-station using the set of candidate locations and signal strength measurements associated with same cell-neighboring sectors or different cell-neighboring sectors.

2. The method of claim 1, wherein the location of the mobile-station is determined to be approximately at a candidate location defined by an intersection of a timing advance belt and a center divider of a serving sector when there are no non-negligible signal strength measurements associated with any same cell-neighboring sector or when there are non-negligible signal strength measurements associated with two same cell-neighboring sectors.

3. The method of claim 1, wherein the location of the mobile-station is determined to be approximately at a candidate location defined by an intersection of a timing advance belt and a sector divider of a serving sector and a same cell-neighboring sector associated with a non-negligible signal strength measurement when there is only one same cell-neighboring sector associated with a non-negligible signal strength measurement.

4. The method of claim 1, wherein the step of determining the location of the mobile-station using the set of candidate locations comprises the step of:

determining a subset of candidate locations from the set of candidate locations using the signal strength measurements associated with the same cell-neighboring sectors; and

determining the location of the mobile-station using the subset of the candidate locations and the signal strength measurements associated with the different cell-neighboring sectors.

5. The method of claim 4, wherein if there are no non-negligible signal strength measurements associated with any same cell-neighboring sector or when there are non-negligible signal strength measurements associated with two same cell-neighboring

sectors, the subset of candidate locations include a first candidate location defined by an intersection of a timing advance belt and a center divider of a serving sector, a second candidate location and a third candidate location, the second and third candidate locations each being adjacent to the first candidate position.

6. The method of claim 4, wherein if there is only one same cell-neighboring sector associated with a non-negligible signal strength measurement, the subset of candidate locations include a first candidate location defined by an intersection of a timing advance belt and a sector divider of a serving sector and the same cell-neighboring sector associated with the non-negligible signal strength measurement, a second candidate location and a third candidate location, the second and third candidate locations each being adjacent to the first candidate position.

7. The method of claim 4, wherein if there are non-negligible signal strength measurements associated with sectors of at least three different cells, the step of determining the location of the mobile-station using the subset of the candidate locations comprises the step of:

forming constraint polygons using sectors from three different cells associated with the non-negligible signal strength measurements; and

determining the location of the mobile-station using the candidate locations belonging to the subset of candidate locations that lie within the constraint polygons.

8. The method of claim 7, wherein the location of the mobile-station is determined to be approximately at an average of the candidate locations belonging to the subset of candidate locations that lie within the constraint polygons.

9. The method of claim 4, wherein if there are non-negligible signal strength measurements associated with sectors of only two different cells, the step of determining the location of the mobile-station using the subset of the candidate locations comprises the step of:

forming a degenerated constraint polygon using the sectors of the two different cells associated with the non-negligible signal strength measurements; and

determining the location of the mobile-station using the candidate locations belonging to the subset of candidate locations that lie within the degenerated constraint polygon.

10. The method of claim 9, wherein the location of the mobile-station is determined to be approximately at an average of the candidate locations belonging to the subset of candidate locations that lie within the degenerated constraint polygon.

11. The method of claim 9, wherein the timing advance value associated with the set of candidate locations being determined is a first timing advance value associated with a first serving base station, the method comprising the additional steps of:

forming a first timing advance belt using the first timing advance value; and

forming a second timing advance belt using a second timing advance value, the second timing advance value being associated with a second serving base station, the location of the mobile-station being determined using intersections of the first and second timing advance belts and the degenerated constraint polygon when the first and second timing advance belts intersect at two points.

12. The method of claim 11, wherein if only one point of intersection lies within the degenerated constraint polygon, the location of the mobile-station is determined to be approximately at the point of intersection that lies within the degenerated constraint polygon.

13. The method of claim 11, wherein if the two points of intersection lie within the degenerated constraint polygon, the location of the mobile-station is determined to be approximately at an average of the two points of intersection.

14. The method of claim 4, wherein if there are no non-negligible signal strength measurements associated with sectors of at least two different cells, the location of the mobile-station is determined to be approximately at an average of the candidate locations belonging to the subset of candidate locations.

15. The method of claim 1, wherein the timing advance value associated with the set of candidate locations being determined is a first timing advance value associated with a first serving base station, the location of the mobile-station being determined using the first timing advance value and a second timing advance value associated with a second serving base station along with the set of candidate locations and signal strength

measurements associated with same cell-neighboring sectors or different cell-neighboring sectors when the second timing advance value is available.

16. A method of determining a location of a mobile-station comprising the steps of:

forming a first timing advance belt using a first timing advance value associated with a first serving base station;

forming a second timing advance belt using a second timing advance value associated with a second serving base station;

determining the location of the mobile-station using the first and second timing advance belts..

17. The method of claim 16, wherein if the first and second timing advance belts intersect at two points and only one point of intersection lies within a constraint polygon formed using signal strength measurements, the location of the mobile-station is determined to be approximately at the one point of intersection that lies within the constraint polygons.

18. The method of claim 16, wherein if the first and second timing advance belts intersect at two points and both points of intersection lies within a constraint polygon formed using signal strength measurements, the location of the mobile-station is determined to be approximately at an average of the two points of intersection.

19. The method of claim 16, wherein if the first and second timing advance belts intersect at only one point, the location of the mobile-station is determined to be approximately at the point of intersection.

20. The method of claim 16, wherein if the first and second timing advance belts do not intersect, the location of the mobile-station is determined to be approximately at a candidate position closest to a line representing a shortest distance between the first timing advance belt and the second timing advance belt, the candidate position being determined using the first timing belt, the first serving base station being a primary base station.